Pursuant to the Examiner's requirement, Applicants herewith submit a listing of the references submitted in the Information Disclosure Statement of March 26, 2002.

The references cited in the IDS and the attached listing have been cited in the International Search Report of the corresponding PCT application. A copy of the Search Report is likewise attached.

The Examiner also rejected certain claims unpatentable over Alexander U.S. Patent No. 5,685,253 in view of Sinclair, Jr., U.S. Patent No. 4,774,902 and Fisher, U.S. Patent No. 3,745,963.

With respect to the Examiner's objections to the drawings, Figs. 1-4 have been labeled as prior art.

Fig. 5 has been amended in order to illustrate the cover portion recited in the claim.

Fig. 9 has been amended in order to illustrate the extending flap (20) in dotted line. The flap is illustrated in Fig. 5 as well. Newly amended Fig. 9 clearly shows the flap means (20) in the extended position projecting downwardly from the hull as required by claims 13 and 14.

With respect to claim 15, Fig. 5 shows flap (20) extending across the central portion of the transom, in the region of the two propellers, and across the full length of the inner edges (6b, 6c) and trailing edges (7b, 7c) of the wing portions.

With regard to claims 16 and 17, Fig. 5 shows hydraulic actuators (21) which are described on page 14, lines 10-17 of the specification. Actuators are provided so that the position of the flap (20) can be adjusted to vary the flap chord and provide differential adjustment to the front and to the rear of the flap.

With respect to claim 21, Fig. 6 clearly shows that the two side wing portions 2b and 2c are inclined upwardly at an angle Δ to the under side of the central portion of the hull. This feature is described in the specification on page 14, lines 23-24. The range set forth is typically 2 to 10 degrees.

It is therefore believed that the objections cited by the Examiner have been overcome by the amendments herein or by the explanations provided.

Claim 18 has been amended in order to correct the objectionable language.

Generally the claims have been amended to remove reference numbers.

With respect to the Examiner's objection to the claims under 35 U.S.C. § 112, first and second paragraphs, it is believed that a skilled artisan would understand when discussing the lift-off speed and design speed of a hull, that these are applicable only when the hull is in the steady state, i.e. traveling in a forward direction at a constant speed. These terms do not, as the Examiner has suggested, apply in sharp turns or abrupt accelerations or decelerations. In other words, the terms are not applicable in non-steady state situations. Accordingly, it is believed that it is appropriate to recite that both lift-off speed and at design speed, the center of gravity of the hull is substantially vertically aligned with center hydrodynamic lift of the lifting surface of the hull. This does not indicate that the two centers are vertically aligned at all other times, such as in turns. In addition, the specification at page 8, line 20 to page 12, line 21 discusses the arrangement of the hull at both the lift-off speed and the design speed with reference to Figs. 5 and 7. These figures show the wetted areas of the hull at each speed as being symmetrical about the center line of the hull, thereby indicating that the hull is not rolling or yawing. The claims also recite that the condition should be met at the lift-off and design speeds, that is, at constant speeds, rather than during acceleration or deceleration.

The Description also refers to the "longitudinal stability" of the hull, page 12, line 33, the "aerodynamic stability", page 13, line 21 and "turning" at page 14, line 1 of the Description. The specification clearly distinguishes between the different modes of operation of the hull and, as such, it will be appreciated that claim 1 considers the alignment of the center of gravity and the center of hydrodynamic lift under steady state conditions and not under the specific conditions of pitching or turning.

The features recited in claims 1-3 are achieved by the shape and arrangement of the hull, such that, as the speed increases and the hull is raised out of the water, the size, shape and position of the wetted area is such that the center of hydrodynamic lift is maintained in substantially vertical alignment with the center of gravity. It would be recognized by a person of ordinary skill that this could be achieved by other hull shapes.

With regard to the aspect ratios, the aspect ratio in claim 1 has been amended to S_1^2/A_1, and the aspect ratio of claim 4 has been amended to S_2^2/A_2. In this connection, the

specification at page 11, lines 8-9 has been clarified. S_1 and A_1 should refer to the design conditions and S_2 and A_2 should refer to the lift-off conditions.

With respect to the Examiner's objection to claims 25 and 26, as noted above, the requirements of claim 1 are applicable when the hull is traveling at the lift-off speed and at the design speed, i.e. at steady state conditions, whereas claims 25 and 26 refer to dynamic stability under pitch conditions. This latter situation is described in the specification on pages 12 and 13. It is possible for a hull to satisfy both requirements as they do not have to be met at the same time. Under dynamic operating conditions, it is apparent that the center of pressure needs to move away from its steady state position in order to oppose any pitch on the hull, such that the hull is caused to return towards to the steady state condition in which the center of gravity and the center of hydrodynamic lift are substantially vertically aligned. The substantially vertical alignment of the center of gravity and center of hydrodynamic lift is with reference to the undisturbed water plane.

With respect to the objections to the claims based upon the references, it is not clear how the Examiner has obtained the aspect ratios from the figures shown in Alexander '253. The reference does not recite that the drawing figures are to scale, and it is purely accidental that the asserted aspect ratios can be discerned from the figures. In other words, it is believed that the drawings cannot provide a proper basis for determining the specific dimensions or relative dimensions of the parts unless the specification indicates that the drawings do so. There is no discussion of aspect ratios in the Alexander document. Thus, it is believed the Examiner's objection should be withdrawn.

Alexander may teach that the centers of gravity and lift should be close to balance, but although hulls built according to the reference may show a small improvement, they do not achieve this under most conditions. Indeed, the methodology described in Alexander would lead one to infer that the results achieved are sensitive to variations in craft weight and propeller types, for example and that different hull shapes may be required for different combinations.

The Examiner states that using Alexander is a starting point and that the amount of wetted planing surface and the location are best determined by experiment, it would be obvious to modify the hull of Alexander to achieve an optimum aspect ratio. It should be understood that hull design is a notoriously difficult art and slight changes in the shape or

configuration of a hull one way or the other may produce drastically different results. Thus, even if one could discern the information suggested by the Examiner, it would not necessarily follow that routine experimentation would result in the achievements in the invention.

One of the purposes of the invention is to eliminate, or at least substantially reduce the sensitivity to porpoising by creating a hull shape that is substantially stiffer in pitch. The planing wetted surface A_1 of the present hull is broadly rectangular under design conditions leading to very low losses. At lower speeds or under pitching conditions, the wetted surface may become more like that shown in the reference fig. 16. However, the conditions are significantly different. In the case of the reference, the planing surface shown is for the design or maximum condition whereas in the present application the cross-hatched area corresponds to the planing or lift-off condition, which normally corresponds to about 30-40 percent of the design condition.

It is evident comparing Fig. 3 and Fig. 7 of the present application with fig. 16 of the reference that the aspect ratio of the prior art hull at design speed is similar to the aspect ratio of the hull of the invention at lift-off (planing) speed. It is further evident that the aspect ratio of the hull according to the invention at design is at least double that of the prior art design and that the aspect ratio of the new hull is at least double that of the prior hull at lift-off speed. This is not a minor modification that can be achieved by simple experimentation or by simply by moving areas around. The effect of doubling the aspect ratio is to halve hull resistance to first order. This is not a simple operation and this explains why this has not been achieved in the past.

Alexander teaches that the amount of wetted planing surface and location are best determined empirically on a case-by-case basis. This would be excessively laborious and would essentially be a hit and miss operation. The distribution and area shown in the present invention is achieved by numerical methods and is feasible because the lift coefficient can be controlled independently of the hull attitude which facilitates optimization.

Fisher explains the problems of achieving optimal trim at high speeds and points out that the trim angle of conventional hulls is limited by porpoising. However, such hulls do not even reach this restricted trim angle at high speeds. Fisher also notes that hulls fitted with surface drives operate at even less desired trim angles. Fisher's hull is effectively cut away

by one or two small tunnels in which the propellers operate, but this is unlikely to have been sufficient to change very much.

The use of dual surface-piercing propellers results in a considerable degree of lift is the rotational sense is as shown in Fisher, or a considerable degree of pull down if they are rotating in the opposite sense. This latter sense of rotation is generally employed by off-shore racing craft as a means of obtaining a satisfactory trim angle. However, this pull down force adds considerably to the effective weight of the craft which has to be supported by the hull. Consequently, there is a considerable increase in the hull resistance.

It should also be understood that achieving the ranges of aspect ratio of the invention is not a result of one simple logical step. Achieving the stated ranges of the aspect ratio requires, among other things, a much higher lift coefficient than is normally available resulting in lower friction resistance, but this requires very precise dimensional geometry and precise control of the flap position. Doubling the aspect ratio reduces the form drag by half. A particular hull 1 form which is shown in the application achieves this. The claimed values cannot be achieve by a normal "V" hull. It might be possible to achieve a relatively high aspect ratio with a flat bottom hull with a 90 degree flap under a single condition of speed and a center of gravity. In calm water, achievement of such an aspect ratio across a wide range would be impossible as the angle of attack would alter with speed. The present invention maintains the angle of attack by varying the flap chord fore and aft by differential operation of the actuators.

The aspect ratios determined by the Examiner by examination of the reference, assuming they are correct, still does not suggest the arrangement of the present invention. The arrangement in the reference is at the maximum and of feasibility of a "V" hull whereas the present invention is a different arrangement.

Hulls manufactured according to the present invention have lift/drag ratios of between 8 and 12 while maintaining a considerable degree of comfort and total absence of porpoising. Planing prior art hulls seldom achieve a lift/drag ratio of 6.

It should be appreciated that any hull has an optimum angle of attack, which although it may be very slightly in speed, typically remains substantially constant. Thus, in the absence of trimming forces generated, for example, by thrust vectoring, flaps, aerodynamic forces and the like, a hull will always adopt an angle of attack which results in a center of

pressure and a center gravity being vertically aligned. However, this may be achieved at an undesirable angle of attack thereby resulting in excessive hull resistance. The hull of the present invention achieves optimum resistance without the need for trimming forces from thrust or the like by insuring that the centers of gravity and hydrodynamic lift are vertically aligned at lift-off and design speeds.

At lower speeds most prior art hulls require a great deal of "trim in" to reduce the angle of attack. At high speeds prior art hulls require considerable "trim out" in order to lift the bow. In nearly all cases, prior art hulls have excessive positive angles of attack at plane speeds and insufficient angles of attack at high speeds. Trimming using thrust vectoring reduces propulsive efficiency and requires complex drives. One of the results of the present invention is to achieve optimum angles of attack at all speeds without thrust vectoring, thereby insuring that the hull provides as little resistance as practical.

It is believed that the present invention clearly distinguishes over the references of record and such a determination is earnestly solicited.

In view of the foregoing, it is respectfully requested that the Examiner reconsider his rejection of the claims, the allowance of which is earnestly solicited.

Respectfully submitted,

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